CLAIMS

WE CLAIM:

1. A system for monitoring one or more physiological parameters for treatment of pulmonary hypertension within a patient, said system comprising:

   One or more implantable sensing devices, said sensing device comprising of at least one inductor coil and at least one sensor, with optional electronic components;

   A non-implantable readout device, said readout device comprising of at least one inductor coil allowing electromagnetic telecommunication and electromagnetic wireless powering.

2. The system of claim 1 wherein said system is used for diagnosis of pulmonary hypertension within a patient.

3. The system of claim 1 wherein said implantable sensing device comprises of at least one capacitive sensor

4. The system of claim 1 wherein said implantable sensing device includes a battery.

5. The system of claim 4 wherein said battery is rechargeable using wireless means.

6. The system of claim 1 wherein said physiological parameters include pressure.

7. The system of claim 1 wherein one or more sensing devices are measuring one or more of the following pressures:

pulmonary artery,

right ventricle,

left ventricle,

left atrium,

right atrium,

left atrium appendage,

right atrium appendage,

mean left atrium pressure,

mean right atrium pressure,

differential pressure between left and right atrium.

8. The system of claim 7 wherein said system calculates the change of pressure over time, dp/dt.

9. The system of claim 1 wherein one or more of the following schemes are used:

resonant,

passive,

active.

10. The system of claim 1 wherein the physiologic parameter being measured is one or more of the following parameters:

pressure,

temperature,

flow,

blood composition,

blood gas content,

chemical composition,

chemical concentration,

acceleration,

vibration.

11. The system of claim 1 wherein said implantable sensing device is fixed in a cavity of the heart.

12. The system of claim 1 wherein said implantable sensing device is fixed in an intermediary structure, including but not limited to

atrial septum,

ventricular septum.

13. The system of claim 1 wherein said system is used for one or more of the following applications:

early diagnosis of pulmonary hypertension and related conditions,

early intervention in treatment of pulmonary hypertension and related conditions,

remote monitoring of patients with pulmonary hypertension and related conditions,

tailoring of medications,

disease management,

identification of complications from pulmonary hypertension related conditions,

identification of complications from pulmonary hypertension related conditions,

treatment of complications from pulmonary hypertension related conditions,

treatment of complications from pulmonary hypertension conditions,

feedback regarding the impact of medication on the heart,

tuning of pacemaker parameters,

feedback regarding the impact of pacing changes on heart function,

reduction in frequency and severity of hospitalizations due to pulmonary hypertension,

reduction in frequency and severity of hospitalizations due to pulmonary hypertension,

identification of mitral valve stenosis,

treatment of mitral valve stenosis including but not limited to surgery and balloon angioplasty.

14. The system of claim 1 wherein said readout device is capable of performing one or more of the following:

remote monitoring of patients with pulmonary hypertension including but not limited to home monitoring,

monitoring of patients with pulmonary hypertension with telephone-based (or similar method) data and information delivery,

monitoring of patients with pulmonary hypertension with wireless telephone-based (or similar method) data and information delivery,

monitoring of patients with pulmonary hypertension with web-based (or similar method) data and information delivery,

closed-loop drug delivery to treat patients with pulmonary hypertension,

closed-loop tuning of medical systems to treat pulmonary hypertension or pulmonary hypertension related conditions,

warning systems for critical worsening of pulmonary hypertension or pulmonary hypertension related conditions,

portable or ambulatory monitoring or diagnostic systems,

battery-operation capability,

data storage,

reporting global positioning coordinates for emergency applications,

communication with other medical devices including but not limited to pacemakers, defibrillator, implantable cardioverter defibrillator, implantable drug delivery systems, non-implantable drug delivery systems, and wireless medical management systems.

15. The system of claim 1 incorporated into a closed-loop system with a right atrium to left atrium unidirectional valve for treatment of pulmonary hypertension.

16. The system of claim 1 incorporated into a open-loop system with a right atrium to left atrium unidirectional valve for treatment of pulmonary hypertension.

17. The system of claim 1 wherein said implantable sensing device is implanted using a surgical technique.

18. The system of claim 1 wherein said implantable sensing device is implanted using a minimally invasive outpatient technique.

19. The system of claim 1 wherein a catheter delivery method is used to implant said implantable sensing device.

20. The system of claim 1, wherein said implantable sensing device uses anchoring mechanisms including but not limited to those used in one or more of the following:
septal occluder devices,
left atrial appendage occluders,
cardiac pacing leads,
screws,
tines,

stents.

21. The system of claim 20 wherein said anchoring mechanism utilizes an anchor that passes through a septum wall and opens on one or both sides of a septal wall, clamping said implantable device to the wall.

22. The system of claim 20 wherein said anchoring mechanism utilizes an anchor that passes through the atrial septum.

23. The system of claim 22 wherein the anchoring method is similar to anchoring of septum occluder devices, wherein two umbrella-shaped anchors one on each side which anchor the sensing device.

24. The system of claim 22 wherein the larger portion of said implantable sensing device is located in the right side of the heart and the smaller portion of said implantable sensing device is located in the left side and includes at minimum one sensor, in order to minimize the risk of thrombogenicity.

25. The system of claim 20 wherein said anchoring mechanism is a helical screw.

26. The system of claim 20 wherein said anchoring mechanism is a tine that expands and catches on a tribeculated area of the heart.

27. The system of claim 20 wherein said anchoring mechanism is made from one or more or any combination thereof the following materials:

nitinol,

teflon,

stainless steel,

polymer,

titanium,

biocompatible metals.

28. The system of claim 1 wherein said implantable sensing device is augmented with one or more actuators including but not limited to:

thermal generators,

voltage sources,

current sources,

probes,

electrodes,

drug delivery pumps,

valves,

meters,

microtools for localized surgical procedures,

radiation emitting sources,

defibrillators,

muscle stimulators,

pacing stimulators.

29. The system of claim 1 wherein said system is part of a closed-loop medical treatment system.

30. The system of claim 1 wherein delivery of said implantable sensing device is accomplished via injection of said implantable sensing device into a large pulmonary artery, wherein blood flow delivers and anchors said implantable sensing device into one or more pulmonary artery with a smaller diameter.

31. The system of claim 30 wherein cell growth and encapsulation occurs over time, in order to further stabilization of said implantable sensing device.

32. The system of claim 1 wherein at least a portion of said implantable sensing device is coated with one or more layers of thin coatings.

33. The system of claim 32 wherein the coating materials include but are not limited to one or more or any combination thereof:

silicone,

hydrogels,

parylene,

polymer,

nitrides,

oxides,

nitric-oxide generating materials,

carbides,

silicides,

titanium.